SB761
UTR6
#81-1

3430 BIOLOGICAL EVALUATION

R2-81-1

Diplodia Tip Blight of Ponderosa Pine in the Black Hills, South Dakota

January 1981

LIBRARY COPY
ROCKY MT. FOREST & RANGE
EXPERIMENT STATION

3430 BIOLOGICAL EVALUATION
R2-81-1

Diplodia Tip Blight of Ponderosa Pine in the Black Hills, South Dakota

January 1981

PREPARED BY: David W. Johnson
David W. Johnson
Supervisory Plant Pathologist

Glenn W. Peterson
Glenn W. Peterson
Plant Pathologist, RMFRES, Lincoln, NE

William G. Telfer
William G. Telfer
Forest Pest Specialist,
South Dakota Division of Forestry

APPROVED BY:

G. L. Downing
G. L. DOWNING
Staff Director
Forest Pest Management

Larry Henson
LARRY D. HENSON
Deputy Regional Forester
State and Private Forestry

Forest Pest Management
Rocky Mountain Region
USDA Forest Service
11177 W. 8th Avenue
Lakewood, Colorado 80225

INTRODUCTION

Diplodia tip blight, incited by *Diplodia pinea* (Desm.) Kickx, was first reported on ponderosa pine (*Pinus ponderosa* Laws.) in the Black Hills of South Dakota during July 1979. The disease had not been previously reported in this area. A biological evaluation was subsequently issued to document preliminary findings (2).

During June 2-5, 1980 additional surveys were conducted. Diseased material was collected from ponderosa pine to confirm previous findings and determine the extent of the problem in the Black Hills. This evaluation was conducted by D. W. Johnson, Supervisory Plant Pathologist, Forest Pest Management; G. W. Peterson, Plant Pathologist, Rocky Mountain Forest and Range Experiment Station, Lincoln, Nebraska; and W. G. Telfer, Forest Pest Specialist, South Dakota Division of Forestry.

METHODS

Field examinations of symptomatic trees were conducted along major highways throughout the Black Hills (Fig. 1). Examinations were concentrated within areas where the disease had been previously reported (2) as well as in areas not surveyed in 1979. Necrotic tissues, including cone scales, twigs, needles and dead buds, from symptomatic trees were examined for fungal fruit bodies. Samples were collected from each site and isolated in culture to confirm the identity of the causal agent. Positive identification was based on the presence of both pycnidia and spores typical of *D. pinea*.

Color photographs were taken of infected trees in two locations to follow progress of disease symptoms for several years and to determine short term effects of *D. pinea* on tree vigor and survival (Fig. 2). Data recorded for trees included d.b.h., age, presence of cones, and disease rating. The disease rating was a modification of that used for dwarf mistletoe (1). The crown was divided into thirds and each third rated as heavy, light, or noninfected. Heavy was rated 2, light 1, and noninfected 0. The sum of these values was recorded for each study tree to follow progression of the disease over time.

RESULTS AND DISCUSSION

Diplodia pinea was confirmed in several locations scattered throughout the Black Hills. Table 1 lists sites visited and laboratory results. Figure 1 shows these locations. Several areas visited were free of symptomatic trees. In most cases the best indication of *D. pinea* infection was the presence of

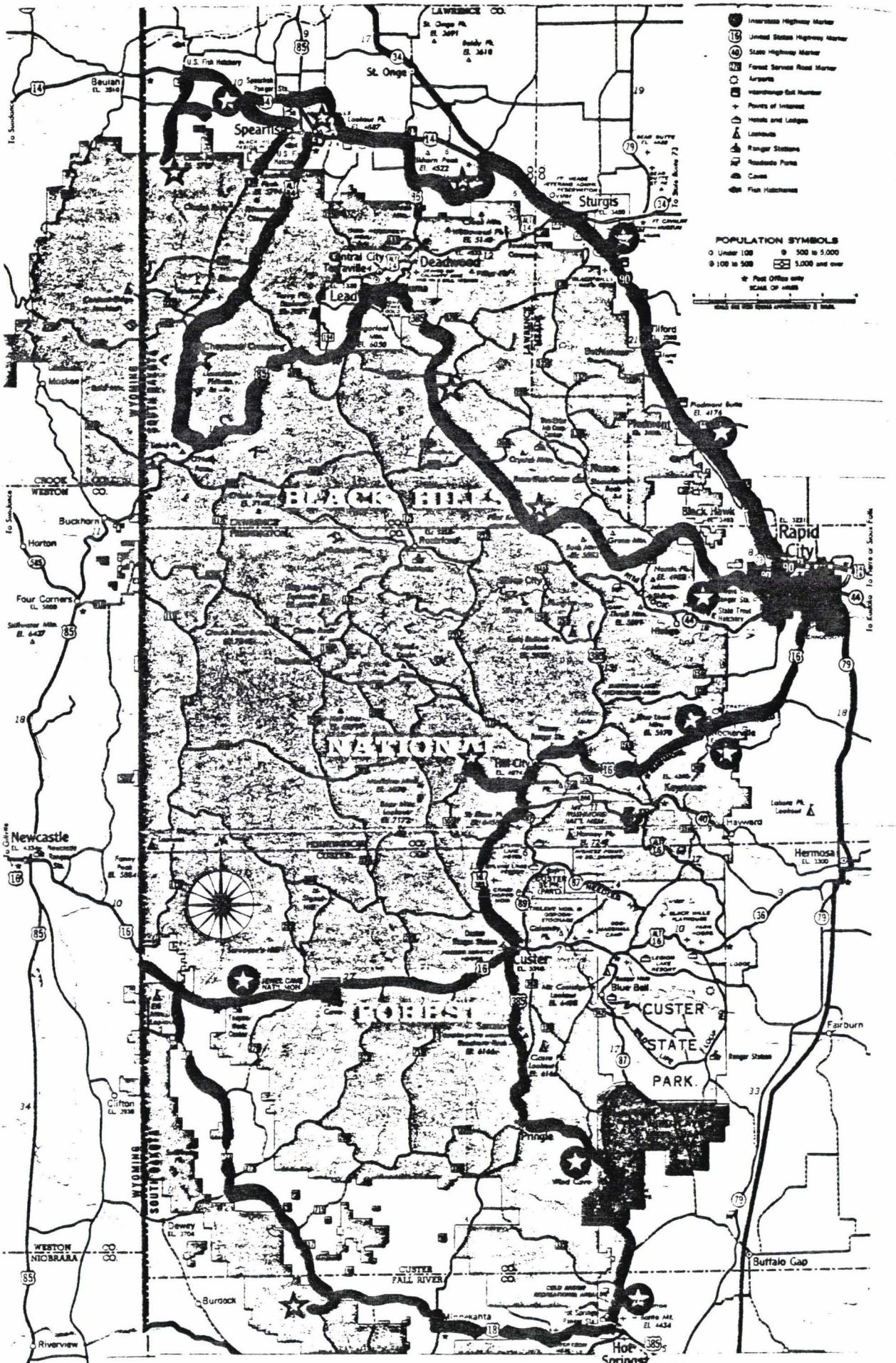


FIGURE 1. *Diplodia pinea* survey - route traveled and survey sites.

★ *D. pinea* confirmed

☆ *D. pinea* negative

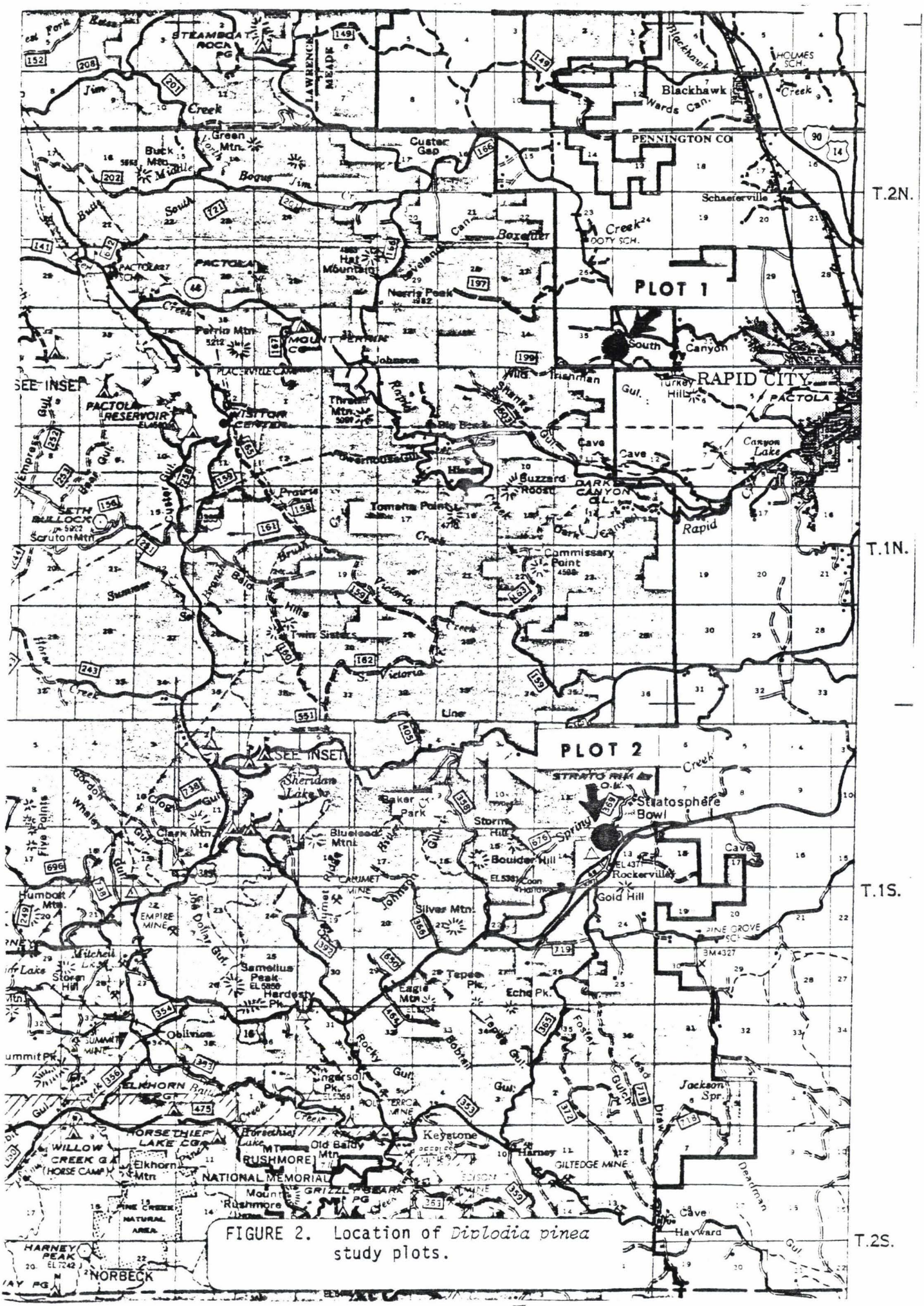


FIGURE 2. Location of *Diplodia pinea* study plots.

TABLE 1. DIPLODIA TIP BLIGHT SURVEY SITES AND LABORATORY ANALYSIS RESULTS.

Survey Sites Where *D. pini* was confirmed

Nemo Road	T. 2 N., R. 6 E., Sec. 36
Rockerville	T. 1 N., R. 6 E., Sec. 13
Cold Spring Creek	T. 5 S., R. 5 E., Sec. 28
Battle Mountain	T. 7 S., R. 6 E., Sec. 18
Teepee Work Center	T. 4 S., R. 2 E., Sec. 6
Petrified Forest Campground	T. 3 N., R. 6 E., Sec. 12
Fort Meade	T. 5 N., R. 5 E., Sec. 14
Higgins Gulch	T. 7 N., R. 1 E., Sec. 36
Rockerville	T. 1 N., R. 5 E., Sec. 10

Survey Sites Where *D. pini* was not confirmed

Reno Gulch	T. 1 S., R. 4 E., Sec. 35

Survey Sites Without Symptomatic Trees

Lookout Peak	T. 6 N., R. 2 E., Sec. 12
Robinson Flats	T. 7 S., R. 2 E., Secs. 3, 4, 10, 11, 13, & 14
Crow Creek	T. 6 N., R. 1 E., Secs. 9, 15, 16, & 22
Little Spearfish Creek	T. 4 N., R. 1 E., Sec. 16
Brownsville	T. 4 N., R. 4 E., Sec. 30
Jim Creek	T. 2 N., R. 5 E., Sec. 10

pycnidia on cone scales. As previously reported the disease appeared most damaging on open-grown trees with numerous cones (2, 3, 5).

Infected buds were observed more frequently than infected, partially elongated new shoots. Needles of the previous year which subtended infected dead buds were commonly dead. In the field, pycnidia were not detected on dead buds with a 10X hand lens; however, pycnidia were observed on these buds in the laboratory using a dissecting microscope. The fungus was readily isolated from dead needles subtending dead buds. Fully elongated necrotic (dead) needles produced pycnidia after incubation for 48 hours or more under dew-point conditions in the laboratory. Isolations from the pith of shoots bearing infected seed cones were negative. In other work by Peterson, the fungus has rarely been isolated from pith tissue. No incubation was needed to obtain pycnidia and spores from typical symptomatic cones.

Affected trees were located mostly in openings and along the edge of stands. Severely affected trees had numerous dead branches. Tree mortality was uncommon. Individual tree infection varied greatly as evidenced by trees in photo plots (Table 2) and figures 3-13. The Appendix includes detailed maps locating photographed trees.

The scattered nature of the disease throughout the Black Hills suggests the fungus is not a recent introduction, but may be native. Weather conditions may have played a significant role in the apparent recent development of diplodia tip blight. High levels of cone infection in combination with humid, wet spring weather would provide ideal conditions for spore dispersal, germination, and bud and needle infection. Continued monitoring of trees in specific sites, such as selected this past year, may shed more light on this subject since we currently lack information on the potential of this fungus to cause damage under natural forest conditions. Additional work, as well as continued monitoring of diseased trees, is planned by the authors for the next year or so. Management guidelines will be formulated for forest land managers if the disease continues to persist and pose a threat to management objectives.

TABLE 2. DESCRIPTIONS OF TREES ON PHOTO PLOTS:

Plot 1. Pennington County Road T. 2 N., R. 6 E., Sec. 36

Tree 1

Age: 85
D.B.H.: 23.3 inches
Disease rating: Top 2 Middle 2 Lower 2 = Crown 6 Total
Notes: Heavy cone crop, many infected cones.

Tree 2

Age: 75
D.B.H.: 17.0
Disease rating: Top 1 Middle 2 Lower 1 = Crown 4 Total
Notes: Light cone crop

Tree 3

Age: 72
D.B.H.: 14.0
Disease rating: Top 1 Middle 1 Lower 1 = Crown 3 Total
Notes: Light cone crop; next to tree 2

Tree 4

Age: 80+
D.B.H.: 23.2
Disease rating: Top 2 Middle 2 Lower 2 = Crown 6 Total
Notes: Heavy cone crop

Tree 5

Age: 80+
D.B.H.: 26.5
Disease Rating: Top 0 Middle 0 Lower 0 = Crown 0 Total
Notes: No cone crop

Tree 6

Age: 69
D.B.H.: 15.8
Disease rating: Top 0 Middle 0 Lower 0 = Crown 0 Total
Notes: No cone crop

Tree 7

Age: 110
D.B.H.: 20.1
Disease rating: Top 2 Middle 2 Lower 2 = Crown 6 Total

Notes: Heavy cone crop

Plot 2. Rockerville T. 1 N., R. 6 E., Sec. 13

Tree 1

Age: 74
D.B.H.: 20.2
Disease rating: Top 2 Middle 2 Lower 2 = Crown 6 Total

Notes: Heavy cone crop

Tree 2

Age: 63
D.B.H.: 16.2
Disease rating: Top 1 Middle 2 Lower 2 = Crown 5 Total

Notes: Medium cone crop

Tree 3

Age: 75+
D.B.H.: 17.4
Disease rating: Top 0 Middle 0 Lower 0 = Crown 0 Total

Notes: No cone crop

Tree 4

Age: 78
D.B.H.: 13.5
Disease rating: Top 1 Middle 1 Lower 0 = Crown 2 Total

Notes: Light cone crop

Pennington County Road Plot 1.

Illustrations of study trees.

Figure 3. Tree 1.

Figure 4. Trees 2, 3

Figure 5. Tree 3.

Figure 6. Tree 4

LITERATURE CITED

1. Hawksworth, F. G. 1977. The 6-class dwarf mistletoe rating system. USDA For. Serv., Rocky Mtn. For. and Range Exp. Sta. Gen. Tech. Rep. 48, 7 pp.

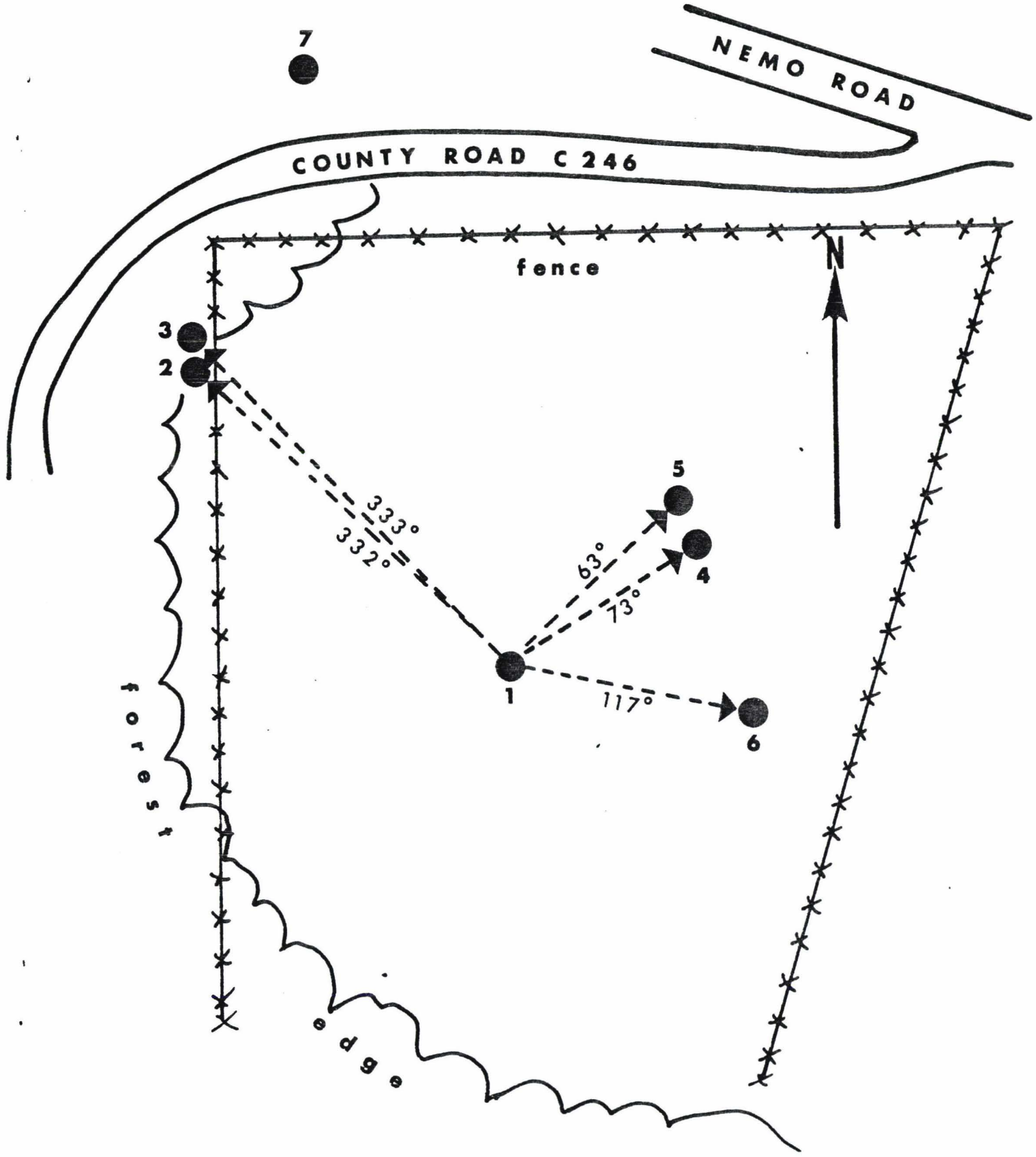
2. James, R. L., D. W. Johnson, and W. G. Telfer. 1979. Diplodia tip blight of ponderosa pine in the Black Hills, South Dakota. USDA For. Serv., State and Private Forestry, Rocky Mtn. Region, Bio. Eval. R2-79-8, 10 pp.

3. Peterson, G. W. 1978. Effective and economical methods of controlling diplodia tip blight. Am. Nurseryman 147(1):13, 16, 70, 72.

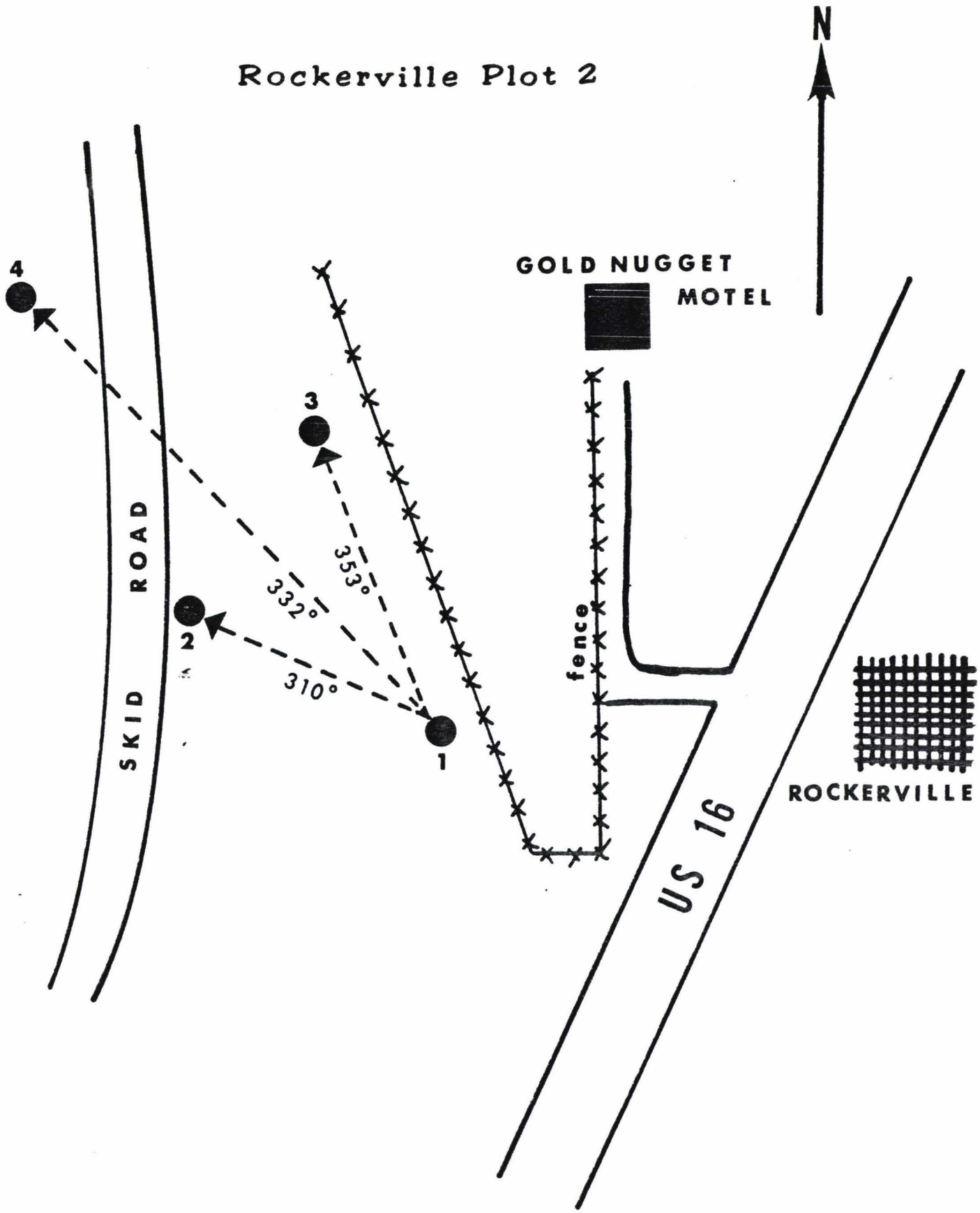
4. Peterson, G. W. 1981. Diplodia blights of pines. USDA For. Serv., Forest Insect and Disease Leaflet-161 (In Press).

5. Walla, J. A. 1979. Diplodia pinea found in North Dakota. Plant Dis. Reptr. 63:464.

A P P E N D I X



Pennington County Rd. Plot 1


Rockerville Plot 2
N
GOLD NUGGET
MOTEL
4
3
2
1
353°
332°
310°
SKID ROAD
fence
US 16
ROCKERVILLE